

ABSTRACT

A single-tilt-rotor VTOL airplanes have a tilttable rotor attached to an elongated power pod containing the collective and cyclical pitch mechanism, and transmission. The power pod is pivotably attached to a base that is slidably mounted on a pair of slotted guide beams attached on top of the roof of the fuselage. The guide beams run longitudinally from the front of the aircraft to past the center of gravity (CG) of the aircraft in order to transport the power pod from the front section to the center section when converting from the horizontal cruising mode to the VTOL mode. In the horizontal cruising mode, the power pod perched horizontally on top of the fuselage front section with sufficient clearance for the rotor to rotate in front of the aircraft. Upon transitioning to the VTOL mode, a telescopic actuator is used to pivot the power pod vertically while a cable-winch system is used to move the entire power pod and base assembly rearwardly to stop at the center of gravity of the aircraft, and vice versa, thus allowing the power pod to travel significantly rearward and forward as required for proper balancing of vertical lift as the power pod pivots 90 degrees during transition from VTOL mode to the cruising mode. A single piston engine, or a single or pair of turbofan engines, mounted slightly to the rear of the CG, have drive shafts that can be clutched and mated onto respective receiving shaft from the transmission within the power pod in order to power the tilttable rotor. The engine is also attached to a propeller for horizontal propulsion, or if turbofan engines are used, jet thrust is generated for horizontal cruise. A small anti-torque rotor or ducted fan toward the tail of the aircraft is mechanically coupled to the engine via a drive shaft to provide the necessary side-way thrust to overcome the main rotor's torque. In the horizontal cruising mode, the tilttable rotor is allowed to windmill slowly at a minimum rotational speed necessary to maintain the integrity of the rotor blades. The same propulsion principle can be applied to VTOL airplanes having more than one tilttable rotor, thereby can potentially increase the speed, range and reliability of current twin-wing-mounted-tilt-rotor aircraft. A pair of high-aspect-ratio wings on both sides of the fuselage provide highly efficient lift during cruising flight with very little induced drag. Conventional horizontal and vertical tail planes are used for directional stability in the cruising mode.